



**Energy Efficiency and Renewable Energy
Federal Energy Management Program**

How to Buy Energy-Efficient Compact Fluorescent Light Bulbs

Why Agencies Should Buy Efficient Products

- Executive Order 13123 and FAR section 23.704 direct agencies to purchase products in the upper 25% of energy efficiency, including all models that qualify for the EPA/DOE ENERGY STAR[®] product labeling program.
- Agencies that use these guidelines to buy efficient products can realize substantial operating cost savings and help prevent pollution.
- As the world's largest consumer, the federal government can help "pull" the entire U.S. market towards greater energy efficiency, while saving taxpayer dollars.

Federal Supply Sources:

- Defense Logistics Agency (DLA)
Phone: (800) DLA-BULB
dscp103.dscpl.dla.mil/gi/general/light1.htm
- General Services Administration (GSA)
Phone: (817) 978-8640
www.fss.gsa.gov

For More Information:

- DOE's Federal Energy Management Program (FEMP) Help Desk and World Wide Web site have up-to-date information on energy-efficient federal procurement, including the latest versions of these recommendations.
Phone: (800) 363-3732
www.eren.doe.gov/femp/procurement
- The EPA/DOE ENERGY STAR[®] program provides product listings of complying CFLs and dedicated residential CFL fixtures.
Phone: (800) 372-7827
www.energystar.gov
- DOE's emerging technology program has awarded basic ordering agreements for supplier to offer screw-based CFLs that meet or exceed these efficiency recommendations. These CFLs, sized to fit most existing fixtures, are offered at competitive prices to government and other large buyers.
Phone: (509) 372-4333
www.pnl.gov/cfl
- Lighting Research Center's Web site has valuable information covering CFLs and other lighting systems.
Phone: (518) 276-8716
www.lrc.rpi.edu
- Lawrence Berkeley National Laboratory provided supporting analysis for this recommendation.
Phone: (202) 646-7950

Efficiency Recommendation

To Replace Incandescent Bulb rated at:	Necessary Light Output (Lumens)	Typical CFL Replacement Wattage ^a	Recommended CFL Lumens per Watt (lpw)
Bare Bulbs^b			
40 watts	495 or more	11 - 14 watts	45 lpw or more
60 watts	900 or more	15 - 19 watts	60 lpw or more
75 watts	1200 or more	20 - 25 watts	60 lpw or more
100 watts	1750 or more	≥ 29 watts	60 lpw or more
Reflector Type Bulbs			
50 watts	550 or more	17 - 19 watts	33 lpw or more
60 watts	675 or more	20 - 21 watts	40 lpw or more
75 watts	875 or more	≥ 22 watts	40 lpw or more

a) Some more efficient lower wattage CFLs can produce equivalent light output to the corresponding incandescents (listed in left-hand column); to assure sufficient lighting, make sure the CFL replacement provides at least enough lumens.

b) Covered bulbs have lower lumens per watt. Recommended lpw for covered lamps are as follows: ≤ 14 watts: 40 lpw; 15-19 watts: 48 lpw; 20-24 watts: 50 lpw; ≥ 25 watts: 55 lpw.

The federal supply sources for CFLs are the Defense Logistics Agency (DLA) and the General Services Administration (GSA). DLA sells CFLs through its *Energy Efficient Lighting* catalog. GSA offers CFLs on Schedule 62-II, as well as through its on-line shopping network, *Advantage!* Look for products that provide the needed light output (lumens) and meet this Efficiency Recommendation.

CFLs are sold either as "integral" bulb/ballast combinations, or "modular" systems, which have one or more pin-based bulbs that may be replaced separately while re-using the ballast. When buying integral CFLs from a commercial source (retailer or distributor), select or specify models with the ENERGY STAR[®] label, all of

Definitions

Compact fluorescent lamps, commonly referred to as compact fluorescent light bulbs or CFLs, are 3-4 times more efficient than standard incandescent bulbs. They produce light through fluorescing phosphors instead of a heated filament.

Lumens are a measure of light output.

Where to Find Energy-Efficient CFLs



which meet this Recommendation. Only integral CFLs, not modular types, are included in the ENERGY STAR® labeling program.

Modular CFLs allow a separate pin-based bulb to be replaced when one burns out. The ballast and base can generally be reused for about five bulb replacements (most ballasts are rated at 50,000 hours). Select or specify modular bulb/ballast systems that meet the recommended levels (above). For a modular CFL, make sure that the bulb's lumen output is rated for the specific ballast used, and that the pin design fits the base.

Some screw-based CFLs are difficult to fit into existing fixtures designed for incandescent bulbs. However, many CFLs now on the market are only slightly larger than standard incandescent bulbs. A few CFL models can be used with conventional dimming switches.

CFLs installed in enclosed fixtures designed for incandescent bulbs may overheat; this can significantly reduce both light output and lifetime. Even under optimum conditions, light output from a CFL will decrease over its lifetime. To maintain existing light levels, select CFLs with rated lumen output (of bulb and ballast together) at least as high as the bulbs they replace.

CFLs should have a power factor (PF) above 50%, and a Color Rendering Index (CRI) above 80%. ENERGY STAR® integral CFLs and most available modular CFLs meet these criteria.

Particularly for highly used fixtures, consider replacing an existing screw-based ("incandescent") fixture with one designed exclusively for CFL use – i.e., a fixture with a hard-wired ballast that accommodates pin-based CFLs (residential CFL fixtures are also covered by an ENERGY STAR® labeling program; see "For More Information").

Buyer Tips

CFL Cost-Effectiveness Examples (CFL replacing a 60 watt/ 900 lumen incandescent bulb)

	Standard Life CFL (moderate use)		Extended Life CFL (high use)	
Performance	Incandescent Bulb Replaced	Recommended CFL (6,000 hr. life)	Incandescent Bulb Replaced	Recommended CFL (10,000 hr. life)
Input watts (and lumens/watt)	60 W (15 lpw)	17 W (60 lpw)	60 W (15 lpw)	17 W (60 lpw)
Annual Energy Use	72 kWh	20 kWh	120 kWh	34 kWh
Annual Energy Cost	\$4.30	\$1.20	\$7.20	\$2.00
Lifetime Energy Cost	\$18	\$5	\$31	\$9
Lifetime Energy Cost Savings	–	\$13	–	\$22

Definition

Lifetime Energy Cost is the sum of the discounted value of annual energy costs based on average usage and an assumed CFL life of 5 years. Future electricity price trends and a discount rate of 3.4% are based on federal guidelines (effective from April, 2000 to March, 2001).

Cost-Effectiveness Assumptions

Energy use in the first example is based on a CFL life of 6,000 hours operating 1,200 hours/year. The second example uses a 10,000 hour CFL operating 2,000 hours/year. The assumed electricity price is 6¢/kWh, the federal average electricity price in the U.S.

Using the Cost-Effectiveness Table

In the first example shown above, a 17 watt CFL is cost-effective, on energy savings alone, if its purchase price is no more than \$13 above the combined price of the 6-8 incandescent bulbs replaced. The second example, for an extended-life CFL, is cost-effective if its price is no more than \$22 above the price of the 10-13 incandescents it replaces.

What If My Energy Prices or Operating Hours are Different?

To calculate Lifetime Energy Cost Savings for a different electricity price, multiply the savings in the above table by this ratio: $\left(\frac{\text{Your price in } \text{¢/kWh}}{6.0 \text{ ¢/kWh}}\right)$. Longer operating hours will make a CFL even more cost-effective.

